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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/681,374	03/27/2001	Xiao-Dong Sun	RD-27727	3259

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH CENTER
PATENT DOCKET RM. 4A59
PO BOX 8, BLDG. K-1 ROSS
NISKAYUNA, NY 12309

EXAMINER

MACCHIAROLO, PETER J

ART UNIT	PAPER NUMBER
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2875

DATE MAILED: 01/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/681,374

Applicant(s)

SUN ET AL.

Examiner

Peter J Macchiarolo

Art Unit

2875

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25, 39-46 is/are pending in the application.
- 4a) Of the above claim(s) 26-38 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25 and 39-46 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 December 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. The reply filed on December 11, 2002 consists of changes to the specification, drawings, and to the claims. Further, the reply consists of remarks related to the prior rejection of claims in the First Office Action. The Amendments have been considered and entered, however, claims 1-25, and 39-46 are not allowable as explained below.

Specification

2. The Examiner has considered the Applicant's amendment to the specification and to the claims, including replacing "alkaline-earth" for "alkali-earth," since in paragraph 14, the Applicant teaches the cathode is "...coated with a triple oxide of calcium, barium, and strontium," which the Examiner recognizes to be alkaline-earth metals. However, the abstract of the disclosure is objected to because it still contains the misspelled word "alkali-earth," and has not been amended in accordance with Amendment-A filed on December 11, 2002. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-22, and 39-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. (USPN 6,250,984).

In regards to claim 1, 2, 7, 12, 13, and 18, Jin discloses in the abstract, that a composition for electron emitters comprises a mixture of carbon nanotubes and metal particles. Jin further discloses in column 7 lines 21-25, that the metal particles can be a metal oxide powder of a desired metallic component that is generally stable, is not pyrophoric, and is readily available. Jin further teaches in column 6 lines 14-19, that a barium metal powder may be used to metalize the nanotubes.

Jin is silent to the metal powder which is added to the nanotubes being barium oxide.

However, Jin further teaches in column 1 lines 35-37, that cathodes coated with barium oxide are well known to further improve electron emission. Further, the Applicant teaches in paragraph 14 that barium oxide is a well-known cathode additive to enhance electron emission. "The cathode is typically a coiled filament of a metal, such as tungsten, coated with a triple oxide

of calcium, barium and strontium that have low work functions,” (Paragraph 14 of Specification).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to formulate a composition for electron emitters comprising a mixture of carbon nanotubes and alkaline-earth metal oxides, since it is well known that carbon nanotubes offer a great intensification of electric field at their tips, and barium oxide coated on a cathode will further improve electron emission. One would be motivated to combine these components in light of both Jin and Applicant’s teaching; i.e. that a coating of barium oxide will further improve the field emission.

The Examiner notes that the limitation in claims 7 and 18, “wherein said carbon nanotubes are produced by a catalytic cracking and pyrolyzing of hydrocarbons” is drawn to a process of manufacturing which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation is afforded no patentable weight (see MPEP 2113). Accordingly, dependent claims 8-11 and 19-22, which further limit the process in claims 7 and 18, are afforded no patentable weight.

In regards to claims 3, 4, 14, 15, 39, 40, 43, and 44, Jin teaches all of the recited limitations of claim 1 (above).

Jin further teaches in column 5 lines 51-59 that nanotubes having a diameter of about 10 to 50nm is known.

Jin is silent to the exact reason one would be motivated to use nanotubes according to this dimension.

However, it is well known in the art that nanotubes of this dimension offer a great intensification of electric field at their tips and perform favorably as electron emitters.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to formulate a composition according to claim 1 (above), wherein the nanotubes' diameters are in a range from about 1nm to about 100nm, since it is well known in the art that nanotubes of this dimension offer a great intensification of electric field at their tips and perform favorably as electron emitters.

In regards to claims 5, 6, 16, 17, 41, 42, 45, and 46, Jin teaches all of the recited limitations of claim 2 (above).

Jin further teaches in column 7 lines 66-67 that in order to provide a desirable field concentration, the density of nanotubes in the mixture is typically below 50 percent volume and advantageously below 10 percent volume at the surface of the emitter.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to formulate a composition according to claim 1 (above), wherein a proportion of the nanotubes are in a range from about 30 percent to about 90 percent by volume, since Jin teaches in order to provide a desirable field concentration, the density of nanotubes in the mixture is typically below 50 percent volume and advantageously below 10 percent volume at the surface of the emitter.

5. Claims 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. (USPN 6,250,984) in further view of Lynn (USPN 6,294,867).

In regards to claim 23-25, Jin teaches all of the recited limitations of claim 12 (above).

Jin is silent to a gas discharge device further comprising a background gas contained within at a pressure of less than about 0.3 kPa, further comprising mercury vapor.

However, Lynn teaches in column 4 lines 31-41, that a background gas (argon) within the range of three to 33 torr is in a discharge chamber with mercury vapor, and this configuration allows a gas discharge device to operate properly.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct a gas discharge device according to claim 12 (above) further comprising a background gas contained within at a pressure of less than about 0.3 kPa and mercury vapor, since is well known in the art that this configuration allows a gas discharge device to operate properly.

Response to Arguments

6. Applicant's arguments filed December 11, 2002 have been fully considered. Amendment-A made to the claims persuade the Examiner to withdraw the initial 35 U.S.C. 103(a) rejections over Zettl et al. (USPN 6,057,637) in view of Hsu et al. (USPN 6,333,598), and in further view of Lynn (USPN 6,294,867). The amendment, however, necessitated the new ground(s) of rejection, Jin et al. (USPN 6,250,984), and in further view of Lynn (USPN 6,294,867), and is therefore made final.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Macchiarolo whose telephone number is (703) 305-7198. The examiner can normally be reached on 7.30 - 4.30, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (703) 305-4939. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

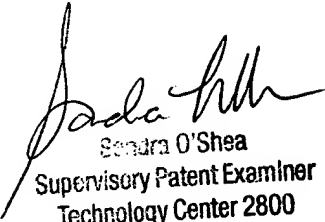
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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

pjm
January 8, 2003



Sandra O'Shea
Supervisory Patent Examiner
Technology Center 2800